

§ 23.1435

is being operated when any headset is being used.

[Doc. No. 26344, 58 FR 18977, Apr. 9, 1993, as amended by Amdt. 23-49, 61 FR 5169, Feb. 9, 1996; Amdt. 23-62, 76 FR 75761, Dec. 2, 2011]

§ 23.1435 Hydraulic systems.

(a) *Design.* Each hydraulic system must be designed as follows:

(1) Each hydraulic system and its elements must withstand, without yielding, the structural loads expected in addition to hydraulic loads.

(2) A means to indicate the pressure in each hydraulic system which supplies two or more primary functions must be provided to the flight crew.

(3) There must be means to ensure that the pressure, including transient (surge) pressure, in any part of the system will not exceed the safe limit above design operating pressure and to prevent excessive pressure resulting from fluid volumetric changes in all lines which are likely to remain closed long enough for such changes to occur.

(4) The minimum design burst pressure must be 2.5 times the operating pressure.

(b) *Tests.* Each system must be substantiated by proof pressure tests. When proof tested, no part of any system may fail, malfunction, or experience a permanent set. The proof load of each system must be at least 1.5 times the maximum operating pressure of that system.

(c) *Accumulators.* A hydraulic accumulator or reservoir may be installed on the engine side of any firewall if—

(1) It is an integral part of an engine or propeller system, or

(2) The reservoir is nonpressurized and the total capacity of all such nonpressurized reservoirs is one quart or less.

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964, as amended by Amdt. 23-7, 34 FR 13096, Aug. 13, 1969; Amdt. 23-14, 38 FR 31824, Nov. 19, 1973; Amdt. 23-43, 58 FR 18977, Apr. 9, 1993; Amdt. 23-49, 61 FR 5170, Feb. 9, 1996]

§ 23.1437 Accessories for multiengine airplanes.

For multiengine airplanes, engine-driven accessories essential to safe operation must be distributed among two or more engines so that the failure of any one engine will not impair safe op-

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eration through the malfunctioning of these accessories.

§ 23.1438 Pressurization and pneumatic systems.

(a) Pressurization system elements must be burst pressure tested to 2.0 times, and proof pressure tested to 1.5 times, the maximum normal operating pressure.

(b) Pneumatic system elements must be burst pressure tested to 3.0 times, and proof pressure tested to 1.5 times, the maximum normal operating pressure.

(c) An analysis, or a combination of analysis and test, may be substituted for any test required by paragraph (a) or (b) of this section if the Administrator finds it equivalent to the required test.

[Amdt. 23-20, 42 FR 36969, July 18, 1977]

§ 23.1441 Oxygen equipment and supply.

(a) If certification with supplemental oxygen equipment is requested, or the airplane is approved for operations at or above altitudes where oxygen is required to be used by the operating rules, oxygen equipment must be provided that meets the requirements of this section and §§ 23.1443 through 23.1449. Portable oxygen equipment may be used to meet the requirements of this part if the portable equipment is shown to comply with the applicable requirements, is identified in the airplane type design, and its stowage provisions are found to be in compliance with the requirements of § 23.561.

(b) The oxygen system must be free from hazards in itself, in its method of operation, and its effect upon other components.

(c) There must be a means to allow the crew to readily determine, during the flight, the quantity of oxygen available in each source of supply.

(d) Each required flight crewmember must be provided with—

(1) Demand oxygen equipment if the airplane is to be certificated for operation above 25,000 feet.

(2) Pressure demand oxygen equipment if the airplane is to be certificated for operation above 40,000 feet.

(e) There must be a means, readily available to the crew in flight, to turn

on and to shut off the oxygen supply at the high pressure source. This shutoff requirement does not apply to chemical oxygen generators.

[Amdt. 23-9, 35 FR 6386, Apr. 21, 1970, as amended by Amdt. 23-43, 58 FR 18978, Apr. 9, 1993]

§ 23.1443 Minimum mass flow of supplemental oxygen.

(a) If the airplane is to be certified above 41,000 feet, a continuous flow oxygen system must be provided for each passenger.

(b) If continuous flow oxygen equipment is installed, an applicant must show compliance with the requirements of either paragraphs (b)(1) and (b)(2) or paragraph (b)(3) of this section:

(1) For each passenger, the minimum mass flow of supplemental oxygen required at various cabin pressure altitudes may not be less than the flow required to maintain, during inspiration and while using the oxygen equipment (including masks) provided, the following mean tracheal oxygen partial pressures:

(i) At cabin pressure altitudes above 10,000 feet up to and including 18,500

feet, a mean tracheal oxygen partial pressure of 100mm Hg when breathing 15 liters per minute, Body Temperature, Pressure, Saturated (BTPS) and with a tidal volume of 700cc with a constant time interval between respirations.

(ii) At cabin pressure altitudes above 18,500 feet up to and including 40,000 feet, a mean tracheal oxygen partial pressure of 83.8mm Hg when breathing 30 liters per minute, BTPS, and with a tidal volume of 1,100cc with a constant time interval between respirations.

(2) For each flight crewmember, the minimum mass flow may not be less than the flow required to maintain, during inspiration, a mean tracheal oxygen partial pressure of 149mm Hg when breathing 15 liters per minute, BTPS, and with a maximum tidal volume of 700cc with a constant time interval between respirations.

(3) The minimum mass flow of supplemental oxygen supplied for each user must be at a rate not less than that shown in the following figure for each altitude up to and including the maximum operating altitude of the airplane.